UNITED NATIONS

GENERAL ASSEMBLY

Distr.
GENERAL

A/AC.105/553
19 November 1993

ORIGINAL: ENGLISH

COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE

REPORT OF THE UNITED NATIONS WORKSHOP ON SPACE COMMUNICATIONS FOR DEVELOPMENT ORGANIZED IN COOPERATION WITH THE GOVERNMENT OF GREECE

(Athens, Greece, 10-12 May 1993)

CONTENTS

	Paragraphs	Page
INTRODUCTION	1-8	2
A. Background and objectives	1-4	2
B. Organization and programme of the Workshop	5-8	2
I. OBSERVATIONS OF THE WORKSHOP	9-23	3
II. SUMMARY OF PRESENTATIONS	24-68	5
A. Communications technologies for development	24-30	5
B. Mobile satellite communications	31-42	5
C. Domestic satellite communications	43-52	7
D. Regional and global telecommunications services	53-68	9
Annex. Programme of the Workshop		13

V.93-90395T

INTRODUCTION

A. Background and objectives

1. On 10 December 1982, the General Assembly adopted resolution 37/90 in which it endorsed the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82). In that resolution, the Assembly decided, among other things, that the United Nations Programme on Space Applications should disseminate, through panel meetings and seminars, information on new and advanced technology and applications, particularly for the benefit of the developing countries.

2. The United Nations Workshop on Space Communications for Development was one of the activities of the Programme approved by the Committee on the Peaceful Uses of Outer Space, during its thirty-fifth session held in 1992, and subsequently endorsed by the General Assembly in resolution 37/90. The Workshop was organized following the decision of the Government of Greece to co-sponsor it as part of its contribution to United Nations activities for International Space Year, 1992. The Workshop was hosted by the Greek Ministry of Foreign Affairs through the Eugenides Foundation and the Hellenic Telecommunication Organization (OTE) at Athens, from 10 to 12 May 1993, for participants from the Mediterranean and adjacent areas.

3. The objectives of the Workshop were to provide the participants with information on the current state and future trends of satellite communications technology associated with various international and regional satellite systems and services, and its contribution to economic and social development. The Workshop also provided an opportunity for managers and specialists to exchange information on their activities in the field and to discuss possibilities for increasing international and regional cooperation.

4. The present report, which covers the background, objectives and organization of the Workshop, as well as a summary of the discussions of the participants and a summary of the technical presentations made, has been prepared for the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee. The participants will report to the appropriate authorities in their own countries.

B. Organization and programme of the Workshop

5. The participants of the Workshop were invited in their personal capacity as experts with several years of professional experience in the fields of satellite communications, telecommunications, educational broadcasting, and in the operation and maintenance of satellite communications systems. The Workshop was attended by 47 participants from the following countries, international organizations and private companies: Albania, Algeria, Azerbaijan, Belarus, Bulgaria, Cyprus, Egypt, Germany, Greece, Israel, Lebanon, Malta, Morocco, Romania, Syrian Arab Republic, Turkey, Ukraine; Office for Outer Space Affairs, Arab Telecommunications Union (ATU), European Space Agency (ESA), European Telecommunications Satellite Organization (EUTELSAT), International Maritime Satellite Organization (INMARSAT), International Telecommunications Satellite Organization (INTELSAT), International Telecommunication Union (ITU), Hispasat, Centre for National Communication Studies (CNET); Indian Space Research Organization (ISRO), OTE; Telespazio and Alenia Spazio.

6. Funds allocated by the co-sponsors for the Workshop were used to cover the cost of international air travel and a daily subsistence allowance for the participants from developing countries; accommodation for 26 participants from developing countries as well as conference facilities and local transportation were provided by the Ministry of Foreign Affairs of Greece, the Eugenides Foundation and OTE.

7. Opening addresses were made by Mrs. V. Tsouderou, Deputy Foreign Minister of Greece on behalf of her Government, Professor D. Kouremenos, Director General of OTE and the Expert on Space Applications, Office for Outer Space Affairs of the United Nations.

8. The programme of the Workshop (see annex to the present report) was developed by the United Nations in consultation with the Ministry of Foreign Affairs of Greece and the Eugenides Foundation. The programme consisted of a series of plenary sessions and a panel discussion.

I. OBSERVATIONS OF THE WORKSHOP

9. It was stated that the main tools in finding new applications of communications satellites for economic and social development were research and development at the national and international levels. At the same time, the realization of the benefits of space technology depended on cooperation at the international, national, particularly bilateral, and regional levels between developing countries as well as between industrialized and developing countries.

10. For the Mediterranean region and its adjacent areas, satellite systems could be an answer to regional and worldwide communications requirements. They could serve as the basis for the development of integrated terrestrial and satellite-based domestic networks.

11. Telecommunications capabilities, satellite regulations and regulatory philosophies differed from country to country and were continuously changing, creating a dynamic environment for global mobile satellite and other telecommunications operations. In view of all those changes, international satellite organizations must be flexible and willing to adapt to changing needs, particularly those of the developing countries.

12. Following political developments in Europe, there was a will to contribute towards greater European unity by cooperation in the telecommunications field. It was possible to see the promotion of a balanced telecommunications development in the Mediterranean Basin and eastern Europe.

13. Geographical conditions and demographical considerations played a role in determining the most efficient use of satellite communications; that applied for every region. For example, most Central Asian countries were land-locked countries with a rather low density population. Those countries had the classic characteristics that would benefit from the type of thin-route links that satellites could provide at lower cost than land lines. In contrast, for a densely populated country, terrestrial cellular networks were a way to bring basic telephone service to every home at a lower cost than utilizing land-line connections.

14. While a number of programmes and technical systems exist, many potential users were in the early stage of awareness of the benefits that could result from the applications of satellite communications in health, education and other government services as well as in specific actions that were part of disaster relief operations. There was a clear need to inform experts and decision makers of the necessary steps to be taken in order to benefit from the latest technological advances.

15. Among the various applications of satellite communications, particularly for developing countries, the participants identified tele-education and personal communications as those that could make substantive and cost-effective contributions to national and regional development, including economic development.

Tele-education

16. The participants evaluated the merits and problems associated with tele-education in both formal and informal education environments and concluded that it was a worthwhile goal for promoting social and economic development, particularly in remote and rural areas.

17. The participants recognized the experience of India in using satellites for formal education. However, in recommending that application, the Workshop stressed that in addition to solving the technical issues, a country interested in satellite-assisted tele-education would need to plan carefully how to reach each intended sector of its population. For that purpose, the tele-education programme should make use of community facilities, being aware of its financial implications and social impact.

18. The participants agreed that there could not be a universal solution since each country in the Mediterranean and adjacent areas differed in terms of geography and population. For Israel, being a small country and having few institutions of higher education, satellite communications could be an appropriate approach to distribute quickly results of scientific experiments from laboratories to institutions of higher education.

19. Participants from eastern European countries observed that their educational system was equipped with skilled personnel; however, it was necessary to support the education of minorities in each country, since terrestrial television distribution did not reach certain countries or did so only in parts of the large countries.

20. At the request of the Workshop, the United Nations Programme on Space Applications agreed to prepare a booklet that would focus on all aspects of tele-education, including the logistics of developing such a programme in a given country. The participants indicated that the booklet would be very useful, particularly for those countries that intended to develop a tele-education programme.

Personal communication

21. The Workshop reviewed the rapid development in personal communications and stressed the need to provide adequate information, particularly to the developing countries of the region, on that subject. The participants cautioned that development of mobile communications in a given country should not be carried out at the expense of fixed satellite communications services, particularly since most of the developers of personal communications services had not, till then, installed specific infrastructure for the new communication mode. Furthermore, the Workshop cautioned on investing in technologies that were searching for users.

Regional cooperation

22. The Workshop noted that a number of countries in the region were developing their own national satellite communications programmes. However, proliferation of such systems could result in frequency interference. That was happening in western Europe where there seemed to be a congestion of satellites. Participants expressed concern that that condition could be the same for the Mediterranean region in the immediate future. They called on their Governments to work together to devise a mechanism that would prevent that from happening.

23. The need for Member States to work together within the Arab countries as well as between the Arab and the Mediterranean countries was emphasized. Equally emphasized was the role that the European Space Agency could play in assisting the emerging countries of the former Soviet Union to improve their communications systems. The support that the Commission of European Communities could offer in that regard was also stressed.

II. SUMMARY OF PRESENTATIONS

A. Communications technologies for development

24. Accessible communications services were an indispensable element of global human activities. A mix of terrestrial telecommunications networks and satellite communications systems met many of the modern demands for communications. Currently, practically every country in the world benefited from a variety of communications services by participation in international, regional or domestic satellite communications systems.

25. Satellite communications technology was fully recognized as a critical tool for social and economic development. Services provided by satellite, such as telephone, radio and television broadcasting and data transmission, had enhanced a country's capabilities to provide medical attention and education to its people, particularly in rural areas, while increasing the country's cohesiveness.

26. The use of that technology had also created a healthier business climate as satellite communications continued to find commercial applications in the distribution of space-gathered data, super-computer networks, visualization of scientific and industrial processes, mobile communications services, journalism and various data services.

27. Various technological trends were combining to make satellite operations less expensive and therefore more viable to developing countries. Those trends included lower cost earth stations, compression and digital modulation techniques, and higher powered and more flexible satellites. The use of such techniques as on-board data processing, efficient networks protocols, effective monitoring and control procedures, power-efficient devices and system miniaturization could further improve the overall cost competitiveness of future satellite systems.

28. With the current pace of geopolitical, economic and technological changes in the world, a reliable and cost-effective communications network had become crucial to the achievement of increasing development goals. It had become indispensable that countries implemented telecommunications networks that enabled their industrial and scientific sectors to interact with counterparts in their country as well as in other countries in order to increase productivity.

29. For the newly independent countries, satellite systems were requirements for regional and worldwide communications. They could provide instant access to other countries and could serve as a foundation for the development of integrated terrestrial and satellite-based domestic networks.

30. The importance of the impact of satellites on tele-education could not be overemphasized. Technological developments had made satellite communications systems a powerful means for distance education and mass communication. Similarly, educators could update their knowledge of the subjects they taught and workers could be trained and re-trained through satellite-transmitted programmes in order to meet changing industrial requirements. Professionals in specialized groups used satellite systems to keep abreast of the latest developments in their field. Adult education courses delivered to homes offered lifelong learning opportunities to all. Distance education could also offer training to agriculture workers to learn new agricultural practices that could lead to establishing agro-industries, thus raising their standard of living.

B. Mobile satellite communications

31. Mobile communications, especially mobile satellite systems was one of the most rapidly developing areas of current radio-spectrum usage. Personal mobile satellite communications were characterized by low-

cost, portable telephone and data terminals and less expensive communications charges than those traditionally associated with satellite communications.

32. In many situations, global personal mobile satellite services provided the missing link, overcoming the inherently local or regional nature of terrestrial mobile services. As a consequence, personal mobile satellite services were rapidly accelerating the growth in worldwide markets for mobile satellite communications.

33. The explosion in mobile communications markets vividly demonstrated the enormous demand for communications mobility. In many parts of the world, that demand was met by mobile satellite services. Even though cellular and personal communications networks continued to expand, economic considerations prevented their spread much beyond populated areas. Rural areas and regions of low population density, in both industrialized and developing countries, appeared destined to be either underserved or out of reach of terrestrial mobile services.

34. The Workshop noted that the INMARSAT personal satellite communications strategy, known as Project 21, was having a far-reaching impact on the ability to communicate instantly to and from anywhere on Earth. The impact was being felt both in developing and developed countries, in businesses, organizations and government administrations. There were currently about 15 million cellular telephone users worldwide. By the year 2000, that figure might increase to more than 100 million users, including cellular telephones, paging services, and aircraft and navigation communications.

35. Under Project 21, INMARSAT had introduced a family of personal mobile satellite communications services that included the following:

(a) INMARSAT C: a low-cost data service using small, inexpensive terminals about the size of a laptop computer. Introduced commercially in 1991, there were approximately 6,300 INMARSAT C terminals currently in service;

(b) INMARSAT M: a service designed to bring voice-quality communications to low-cost small terminals, including the briefcase satellite telephone. Introduced in 1992, INMARSAT M brought the advantages of satellite voice to the maritime environment;

(c) Global Satellite Paging: in 1994, INMARSAT would introduce the service to pocket-sized pagers, benefiting business executives, journalists, salespersons, couriers and travellers, who could then be contacted no matter where they were;

(d) INMARSAT P: a portable hand-held terminal that would operate with a new generation of more powerful satellites. The terminal would be introduced commercially in the period 1998-2000.

36. The Workshop noted that investment in satellite systems was growing around the world. The number and complexity of space networks notified to ITU for international coordination and recording had increased substantially. The technological developments in computer-related processing facilities and the innovations in the switching and transmission domain were associated with decreasing costs and prices, and generated both a growing demand and an increasing competition among the providers. The trend of changing from government services and monopolies to competitive communications enterprises was accompanied by varying degrees of deregulation. Telecommunication services were no longer just tariffed, stocked and connected on demand; they were marketed.

37. The increasing demands for transmission frequency allocations that the emerging mobile satellite systems would require had become a primary concern of the frequency spectrum managers. Within ITU those allocations were dealt with by the World Administrative Radio Conference (WARC). WARC had

progressively established the International Radio Regulations that were annexed to the ITU Convention. Evidence of the growing interest in mobile communications was clearly manifested in the most recent WARC held at Torremolinos, Spain, in 1992.

38. With reference to satellite communications, the Convention includes the following elements:

(a) Rights and obligations of the States in obtaining access to the frequency spectrum/satellite orbit resources;

(b) Frequency spectrum allocations to various space service categories;

(c) International recognition of the used frequency/orbit resources by the recording of frequency assignments and orbital positions in the Master International Frequency Register.

39. Within the framework of the activities of ESA, Alenia Spazio was responsible for the implementation of two payloads for mobile communications services. The European Land Mobile System (EMS) would be included on the Italsat F2 satellite and the L-band Land Mobile Payload (LLM) would be included on the Artemis satellite. EMS would provide pre-operational mobile communications for western Europe and parts of eastern Europe and North Africa; LLM would be used to promote the development of technologies for future commercial mobile communications systems. Alenia Spazio also participated in the Globalstar system, the worldwide seamless cellular satellite system that would rely on a 48-satellite constellation, with eight in-orbit spaces and would combine the use of Low Earth Orbit (LEO) satellites with existing terrestrial communications systems and Code Division Multiple Access (CDMA) techniques.

40. The current status of wireless telephone communication, especially in developed countries, relied on ground-based infrastructures, the exceptions being aeronautical and naval applications where satellite systems were currently used.

41. The ground-based approach was viable when the following main conditions were simultaneously satisfied: the existence of basic infrastructure, favourable landscape, highly populated areas and widespread welfare. Since the applicability of a ground-based wireless network was limited by the above-mentioned factors, not all potential markets would meet those conditions. As those conditions were marginally met, the commercial attractiveness of the ground-based systems decreased.

42. The global operation of a mobile satellite system required more than a worldwide satellite system and communications network. It also required an equally intricate network of international cooperation and agreements. Global services could not be successfully implemented without close, intensive and continuous cooperation and agreement from any country in which service was to be made available. That cooperation was needed to ensure permission to operate mobile terminals in national territories, provide appropriate regulatory approvals to coordinate worldwide standards and resolve frequency spectrum coordination, operational accounting and other issues. Without those mechanics for receiving international commitment and support, the planning of a worldwide global mobile satellite service could be very difficult. In western Europe, it was envisaged that due to the increasing requests for services and a favourable political situation, there would be a Pan-European system based upon the Global System for Mobiles (GSM).

C. Domestic satellite communications

43. It was stated that the modernization of the telecommunications network had been a matter of high priority for the Government of Greece. To date, that network was based on a mixture of analogue technologies. The task of achieving the modernization of the network had been given to OTE, which to an increasing degree was turning to private industry. Within the private sector, INTRACOM, the major private

industrial company in telecommunications, telematics and electronic equipment in Greece, was the most important supplier of OTE.

44. In collaboration with major international telecommunications companies, INTRACOM designed, produced and supported Stored Program Controlled (SPC) digital exchange and provided solutions adapted to promote a telecommunications growth environment. The research and development activities of INTRACOM focused on the study and development of telecommunications software for digital switching, special type multi-function terminals, Very Large Scale Integrated (VLSI) component design, new telecommunications services and wireless communications. Active participation in major European organizations, such as the European Telecommunications Standards Institute (ETSI) and the European Association of Industries, allows INTRACOM to participate in future developments in telecommunications in the European Economic Community.

45. Spain's Hispasat Programme aimed to establish a national satellite communications system that would satisfy the future service needs of the Integrated Spanish Communications Network. In arriving at the decision to develop Hispasat, the Government of Spain and the participating industries took into account the following advantages:

(a) Strategic: the Government of Spain would be able to guarantee the continuity and stability of communications via satellite without being subject to the various interests inherent in an international organization;

(b) Technical: a footprint that was specifically adapted to Spanish territory would provide a more powerful signal, allowing for simpler reception stations with a reduced antenna-size;

(c) Economic: the Hispasat Programme would seek to guarantee product quality while procuring the greatest possible participation of its national industry.

46. Spain's Satellite Communications System was a multi-mission system programme to satisfy, in a unified way, the national needs in satellite communications. It supplied satellite capacity to transmit television images, radio and associated signals in accordance with current and future national needs. The System provided a base for special national defence communications, supplied channels for specialized data networks and provided a satellite base for television programmes addressed to the Spanish-speaking community in the Americas.

1. Very Small Aperture Terminals: Low-cost Earth stations

47. Very Small Aperture Terminals (VSATs) were ground-receiving antennas that offered features that could not be provided via terrestrial networks as, for example, a greater control over operations and costs of communications for specific projects or programmes. VSAT technology also provided consistency and system-design flexibility. That made a VSAT network cost predictable and easier to budget. Every ground station in the network could have the same equipment or VSATs could provide protocol conversion to allow devices with different protocols to communicate across the network. As the network size (i.e. number of VSATs) increased, the cost to provide service at each VSAT decreased.

48. In all domestic industries, the lowering of Earth station costs, while increasing service flexibility, had promoted the growth of the market for VSATs. Currently, VSATs could handle a range of voice, data and video applications, ranging from satellite news-gathering operations used by major broadcasters to low-cost data networks that provided prices of crops and agricultural supplies to isolated farmers in rural areas.

2. Communications in disaster-relief applications

49. The observation of Earth from space provided an invaluable means of forecasting and thus helping to prevent environmental disasters. The combination of remote sensing and communications satellites permitted the responsible agencies to effectively solve problems of distress, alert, localization of problem areas or potential problem areas as well as the possibility of monitoring redress action.

50. It was reported that in Italy, Telespazio had developed and engineered the ARGO Project, a system that provided real-time monitoring of environmental data (seismic, volcanic and hydrogeological) through 110 fixed VSATs, which were located across the national territory. In case of disaster, ARGO could restore emergency communications by means of 12 transportable stations. Both sets of facilities were connected via EUTELSAT satellites to the Operational Civil Protection Centre of Rome and to a master station at Fucino. The same type of architecture could be adapted to fulfil requirements of data collection and monitoring, and to restore emergency communications in any country or region in the world following a catastrophe.

51. Telespazio had a micro satellite system, TEMISAT, which provided collection and distribution capabilities of environmental and distress data from and to autonomous networks. The TEMISAT system was composed of three main segments:

(a) A Space Segment consisting of two micro satellites that constituted a low-cost satellite system based on a Time Division Multiple Access/Single Channel Per Carrier (TDMA/SCPC) scheme with an expected operational life of five years per satellite;

(b) A Ground Support Segment consisting of a Mission Control Centre, which processed, managed and stored the mission data and prepared the User Routing Matrix. That matrix contained the polling sequence, the synchronization and the addressee identification codes of the Earth stations;

(c) A User Segment, consisting of the User and Data Collection Centre terminals. User terminals were connected to as many as a thousand sensors and were the primary source of field data; terminals at the Data Collection Centre served to access the data for prevention or mitigation of the effects of disasters.

52. The Mediterranean Maritime Risks and Emergencies System (SERIMAR) was developed by Telespazio specifically for the timely evaluation of accident risks in the Mediterranean Sea. The SERIMAR provided decision and management support for post-disaster relief operations to minimize the economic and environmental effects of disasters as well as support for the evaluation of economic and environmental effects of disasters. For its objectives, SERIMAR utilized atmospheric, meteorological and oceanographic data, coastal-zone topography and information on port infrastructure. The data were gathered from national and international data banks as well as from coastal radars, satellite-based localization techniques (Global Positioning System) and from Earth observation satellites such as the Earth Resources Satellite (ERS-1). Thus, SERIMAR combined both the Earth observation satellites with space communications into an extremely viable tool for disaster mitigation.

D. Regional and global telecommunications services

53. It was stated that the Mediterranean region was an area that had historically been a crossroad of civilizations and therefore an area where communications were of a particular importance. Telecommunications were starting to replace traditional communications (e.g. by land, sea and air) especially in a century in which the Mediterranean region had become a strategic area and where a highly developed North-West met a developing South-East.

54. EUTELSAT played an important role in promoting a balanced telecommunications development in the Mediterranean Basin and in eastern Europe. One of the objectives of EUTELSAT was to stress the importance of and promote access to telecommunications by satellite with a view to enhancing relations between countries and their economies as well as to promoting cooperation in that field.

55. The EUTELSAT system had been originally designed to provide full western Europe-Mediterranean coverage. However, in response to the political developments of the 1990s, the fourth and fifth versions of the EUTELSAT II satellite were modified in order to provide coverage of eastern Europe and of the Russian Federation as far as the Urals. Since January 1990, EUTELSAT membership had increased with the participation of Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Croatia, Czech Republic, Georgia, Hungary, Lithuania, Poland, Romania, Slovakia and Ukraine.

56. EUTELSAT currently operated a fleet of eight geostationary satellites. With 90 operational Ku-band transponders in orbit, EUTELSAT was the prime provider of telecommunications satellite capacity in the Euro-Mediterranean area. The fifth EUTELSAT II satellite was to be launched in December 1993, improving the coverage of eastern Europe.

57. The range of telecommunications services provided by EUTELSAT included:

(a) Telephony services: telex, facsimile and voice communications making use of Time Division Multiple Access (TDMA) technology. The participation of eastern European countries to benefit from those services was underway. In 1991, Romania had begun using the system. An Earth station was currently being tested in Poland. Croatia was planning to install a station in 1993-1994 while Azerbaijan and Bosnia and Herzegovina were planning to purchase a similar ground station;

(b) Business services: since 1986 EUTELSAT had had its Satellite Multiservices System (SMS). Direct voice and facsimile connections could be established between companies located, for example, in Morocco and the Russian Federation or between Egypt and the Ukraine. The SMS system provided a large number of communications links into central and eastern Europe;

(c) Land Mobile Services: since 1991, EUTELSAT had offered a Pan European Messaging and Positioning Service called EUTELTRACS for land mobiles. As a result, free circulation of mobile terminals was permitted in more than 20 European countries;

(d) TV/Transponders lease services: there were 35 television programmes and more than 40 radio programmes transmitted via the EUTELSAT network. The coverage reached 700 million viewers throughout Europe and the Mediterranean Basin. Since 1992, one Hungarian and two Polish channels had begun using EUTELSAT.

58. Specific action was being taken to promote the development of satellite TV in central and eastern Europe. In support of those actions, EUTELSAT was assisting in the development of a television project known as "MOSAIKA", which would assist in broadcasting programmes made in central and eastern Europe, thus contributing towards a greater cultural, economic and political integration of countries. In addition, a capacity of nine channels was being provided from Turkey and North Africa (six Turkish programmes, one Egyptian, one Moroccan and one Tunisian).

59. The role of ESA in the field of telecommunications was to promote advanced space techniques and their applications in support of European industry in space telecommunications. Currently, ESA had the following three programmes concerning fixed and mobile satellite services: (a) Olympus, which had been operational for several years; and (b) Artemis and Mercure, which were being developed. All shared a common coverage area centred in Europe. The objective of the three programmes was to experiment providing new services,

including distance learning, data distribution to remote areas and communication with mobiles. All three of those services could be of benefit to developing countries.

60. The objectives of the Olympus programmes were the development, launch and in-orbit operation of a multi-purpose platform and of an advanced series of telecommunications payloads. Those payloads were selected to advance the technology capabilities of European industry and to stimulate new-user applications. Olympus was launched in 1989 and positioned at an orbital location of 19° W. The Olympus satellite was the largest telecommunications satellite developed by ESA.

61. The utilization of Olympus had been very successful. It had provided a plethora of experiments and applications covering a wide range of fields. Through the 10/20/30 GHz Propagation Payload, the experiments (coordinated by the Olympus Propagation Experimenters group) included specific tasks such as the evaluation of data processing software, radiometry and signal attenuation. Most of the experiments were based in Europe, with one in Canada and one in the United States of America. Within the 14/12 GHz Specialized Services Payload, the experiments included Satellite-Switched Time-Division-Multiple-Access (SS-TDMA) schemes. The British Telecom, the Danish PTT and the Deutsche Bundespost were major experimenters of Olympus payloads. Other payload experiments had included high-speed data transfer from the European Organization for Nuclear Research (CERN) at Geneva to other nuclear physics research sites.

62. Still other payloads of the Olympus included the Television Broadcast Communications (TCB), with major application areas in tele-conferencing and tele-education. TCB focused on a simultaneous multi-presence video conferencing system, called the Direct Inter-Establishment Communications Experiment (DICE), allowing up to four sites to be connected simultaneously with video, audio, computer graphics and data facilities.

63. The role of a satellite-based system for mobile communications was discussed. It was clear that in terms of cost and spectrum efficiency, a satellite system could not compete with the pan-European cellular system that had started operations in 1992 in several European countries. However, a satellite system for Europe had two advantages: (a) it provided a wide area-coverage system that covered regions economically important (i.e. eastern Europe, Middle East and North Africa); and (b) it provided flexibility; that is, the ability to adopt to new and changing situations and to allow rapid implementation of new services. By the end of the century, it was expected that the Mobile Satellite System (MSS) would be integrated into the terrestrial system and would occupy a fraction of up to 10 per cent of the European mobile telecommunications market with an estimated 10-20 million users.

64. The EMS payload, to be included on the Italsat F2, would provide two-way communications between fixed Earth stations and land mobiles located in Europe and North Africa. The Italsat F2 satellite was scheduled to be launched at the end of 1994. The successor of EMS would be the LLM payload, which would be launched with Artemis for the Advanced Relay and Technology Mission in April 1996. In order to carry out land mobile communications and inter-orbit link experiments, Artemis would be positioned initially over Europe, between 6° and 19° E. Both EMS and LLM were to provide an experimental service to Europe and the adjacent regions, namely, the Mediterranean, the Middle East and the Russian Federation as far as the Urals.

65. The Mercure Programme was a global, not simply regional satellite communication system designed by European industry under the auspices of ESA. That system would allow the United Nations Environment Programme (UNEP) to monitor the global environment (i.e. changes in atmospheric composition, the climate system, water and air pollution, and deforestation). In order to do so, UNEP needed to collect, analyse and distribute environmental data to its users (regional, subregional and national centres). Considering the large amount of data involved and the distance between the centres in charge of the data acquisition and processing

and the users, a satellite-based communication infrastructure seemed the most efficient solution. That would also allow UNEP to exploit other interesting features of a satellite system, such as the possibility of transmitting the same information to all users located within the coverage of the satellite downlink antenna (broadcasting). That approach would provide ease of tailoring, required capacity in terms of satellite communications channels and above all, would require only a short time to put the system in place and make it operational.

66. The Mercure network scheduled to be operative in 1995 would have a global worldwide coverage, with the Western and Eastern hemispheres divided by an axis through Geneva and Nairobi, the European and African regional nodes acting as main traffic hub stations. A third station, located at the INTELSAT station at Leuk in Switzerland, would perform overall network control and administrative functions, such as traffic counting and billing, as well as monitoring the quality of the service. The initial implementation of the system foresaw 16 stations that, in addition to Geneva and Nairobi, would include Sioux Falls (United States of America) and São José dos Campos (Brazil), for the Western hemisphere, and Arendal (Norway), Warsaw (Poland), Kiruna (Sweden) and Bangkok (Thailand), for the Eastern hemisphere. ESA participating States would pay for the development of the system, including the network control facilities in Switzerland, and would support UNEP in its planning and implementation of the system. UNEP would bear the annual cost of operating the system.

67. Within the League of Arab States, ATU was the main body responsible for regional cooperation and international coordination of the satellite communications system in the Arab world. Its overall objectives were: to establish databases for telecommunications in the Arab countries; to conduct research and development particularly in scientific and technical education; to promote local manufacture of telecommunications equipment; to maintain an external international cooperation in the development of telecommunications; to facilitate coordination with the Arab State Broadcasting Union (ASBU) and the Arab Space Communication Satellite (ArabSat) for the optimal use of the Arab space network.

68. For the immediate future, ATU also contemplated the following goals and actions: (a) to accelerate the expansion of the telecommunications network in the region to reach an average density of 10 main lines per 100 inhabitants; (b) to provide the business community with new services while ensuring the profitability of telecommunications operations; (c) to strengthen existing communications training centres in the area; and (d) to provide assistance to the least developed Arab States in the region for the development of their telecommunications network.

Annex

PROGRAMME OF THE WORKSHOP

Chairperson: M. Moutsoulas (Greece)

Date	Time	Subject	Speaker
Monday 10 May	0900-0930	Opening ceremony	M. Moutsoulas, Eugenides Foundation
			A. A. Abiodun, United Nations
			V. Tsouderou, Deputy Foreign Minister of Greece
	0930-1000	Opening address Development of Telecommunications in Greece	D. Kouremenos, Hellenic Telecommunication Organization
	1000-1030	Keynote address New communication technologies for development	M. Belfort, CNET
		Mobile satellite communications	
		Chairperson: G. Maliotis (Cyprus)	
	1045-1125	ITU new structure, WARC 92 decisions with emphasis on mobile satellite communications	G. Kovacs, ITU
	1125-1215	INMARSAT mobile satellite communications: Project 21	G. Berzins, INMARSAT
	1400-1440	Global wireless telephone communications	M. Fargnoli, T. Sassorossi, Alenia Spazio
		Domestic satellite communication services and applications	
		Chairperson: M. El Kadiri (Morocco)	
	1440-1520	Current trend and prospects of the Hispasat system	J. A. Gibanel, Hispasat
	1535-1620	Space communications for disaster mitigation	F. Ananasso, Telespazio

	1620-1700	Satellite communications for education programmes	K. Narayanan, ISRO

Regional telecommunication services

Chairperson: M. Corciova (Romania)

Tuesday 11 May	0900-0940	Regional satellite communication networks in Europe: Olympus, Artemis and Mercure programmes	A. de Agostini, ESA
	0940-1020	EUTELSAT's role in providing pan-European communications network: special emphasis on improving communications in the Mediterranean Basin and adjacent areas	A. Patacchini, EUTELSAT
	1020-1100	Communications in the Arab world: opportunities, experience and future trends	M. Abdalla, ATC

Communications and development

Chairperson: L. Pap (Hungary)

	1110-1150	Telecmedicine for space and other remote locations	C. Soulez-Lariviere, ESA
	1240-1700	Visit to INTRACOM Presentation and visit to facilities	

Discussions and conclusions of the Workshop

Chairperson: A. A. Abiodun (UN)

	0900-1200	Panel discussions and observations of Workshop	UN
	1200-1230	Closure	A. A. Abiodun, United Nations M. Moutsoulas, Eugenides Foundation